

✓ WHAT TO EXPECT FROM A FARM FREEZER ✓

Compiled by

Electro-Agriculture Section
Technical Standards Division
Rural Electrification Administration

Perhaps the simplest method of preserving foods is to freeze them. This is especially true of meats and fruits, and it amounts to a considerable saving in labor. As compared with canning, New York homemakers estimated that freezing of foods required from one-third to one-half the time. Small quantities of surplus fruits and vegetables at their best can be frozen and stored as they become available in the garden.

TYPES OF FREEZERS1. Chest Type Freezer

This freezer has a lift top door, which unless counter balanced may be difficult to lift and to keep open while working in the freezer. Counterbalances will aid in raising the lid and may be designed to hold it in any desired position when open. The danger of the door falling on a person is also eliminated. The height of the freezer should be limited to approximately thirty-six inches, and the width should be such that any part of the storage space may be easily reached. In the larger sizes having more than one lid, the flat surface of the freezer top may provide a convenient and useful working surface when packages are being placed in the freezer or rearranged. This is easier than having to use the floor or to provide a table for this purpose.

Wire baskets and dividers, even though they decrease the available storage space, should be provided with each freezer to facilitate storing food packages in an orderly manner. The baskets should not be so large that it will be difficult to lift them when filled. When properly inventoried, any package in the storage space can be located with a minimum of effort.

The chest type freezer does not frost as quickly as the upright type but it may be more difficult to defrost. When defrosting a loaded chest type freezer, some of the food must be removed from it, thus making space to scrape a portion of the freezer surface. After that it is only necessary to shift food in the freezer to the defrosted area. This also holds for a partially filled freezer.

More floor space is required by a chest type freezer than an upright of the same storage capacity. This is due to the limitation of making the height and the depth of such dimensions that any part of the storage compartment may be accessible. One dimension should be such that the freezer will pass through a 30 inch doorway. Therefore, to obtain storage space the length of the freezer must be increased.

2. Upright Type Freezer

This type of freezer has side opening doors. In addition, some have inner doors to prevent losing the cold air from the storage space when opened. It requires less floor space than the chest type, however enough space must be provided for opening the doors. Due to the fact that it occupies a smaller floor area than the chest type, the floor must be stronger to support it when fully loaded. The depth of this freezer should also be such that it will pass through a 30 inch doorway.

One argued advantage of the upright freezer is the ease of obtaining packages from any portion of the storage compartment. It should be borne in mind that in the freezer, unlike the household refrigerator, packages often fill all available storage space. When a package must be obtained from the back of the freezer, those in the front must be removed and placed on the floor, door shelf or a table provided for this purpose. If the package is in the bottom section then it may be necessary to bend over, or perhaps kneel or sit on the floor to locate it. To facilitate the inventory of food packages, sliding drawers or several shelves may be provided. However these aids subtract from the available storage space.

The upright freezer requires more defrosting than the chest type due to the warm air entering the storage space when the doors are opened. On the other hand, it may be easier to defrost since the frost may be scraped from the shelves into a container.

SIZE OF COMPARTMENTS

The size of the storage and freezing compartments will depend upon the use which will be made of the freezer. For farm family use the Bureau of Human Nutrition and Home Economics, United States Department of Agriculture, Beltsville, Maryland recommends from 5 to 6 cubic feet of storage space for each person in the family. Each cubic foot of storage space will hold about 25 to 30 pounds of frozen food.

If freezing is to be done, a separate freezing compartment is recommended. This ordinarily should not exceed 10 percent of the total freezer capacity. One authority recommends that the quantity frozen should not exceed five percent of the capacity of the larger freezers. The quantity that may be frozen in the smaller freezers is very limited. The U. S. Department of Agriculture reports the satisfactory freezing of 50 pounds of meat in a 20 cubic foot home freezer, with 11 pound roasts as a part of the load. In general, freezers of over 18 cubic feet capacity have a freezing compartment. This compartment will reduce the temperature rise in the storage space when freezing is done.

Fans are sometimes placed in the freezing compartment to increase the freezing rate. With forced air circulation the maximum freezing time is approximately one-half as long as compared with still air. The increase attained in this manner does not add appreciably to the quality of the food, and the time saved is of little value to the home user since the freezing compartments, if properly designed, are of such size that the

recommended freezing load may be frozen and the temperature throughout the freezer will be back to zero degrees Fahrenheit within 24 hours without the use of a fan. Although a fan will increase the freezing rate, it is ordinarily not enough to permit freezing of two loads a day. Dr. D. K. Tressler, frozen foods consultant, reports that about 14 hours are required to freeze a 3-3/4 pound roast in still air. Professor J. R. Tavernetti, California writes, "Although tests have indicated that quick freezing makes a somewhat better product, it is not a necessity, and a good product can be obtained by slow freezing (freezing within 24 hours)."

The length of time that meat can be kept in the freezer depends upon the temperature. Dr. D. K. Tressler reports that pork will become slightly rancid in four months at 10 degrees Fahrenheit. It will be in perfect condition at the end of 12 months if kept at zero. Poultry is subject to rancidity to about the same degree as pork. These findings are verified by the U. S. Department of Agriculture.

In general, freezers are provided with refrigerated plates or with coils welded to the inner walls of the freezer and located on the side next to the insulation. Some freezers have refrigerated plates that also serve as the inner liner. Refrigerated plates are also often used as shelves in the upright freezers and as dividers in the chest type. When so used, they aid in providing a more uniform temperature throughout the storage compartment. Coils on the outside of the inner liner will also give a reasonably uniform temperature provided they are properly spaced and the compressor capacity is adequate. In any case, the freezer should have enough cooling surface to obtain the proper temperature throughout the storage space without the surface temperatures being lower than -20° to -30° Fahrenheit.

Very low surface temperatures are hard on the compressor and also tend to dry out the food. Cycling of the mechanical equipment will also cause some dehydration of the food. Moisture-vapor-proof paper and containers must be used to prevent moisture from escaping from the packages.

The interior finish should be such that it will not impart foreign flavors to the food. It should also be rust free. The inner surfaces should be smooth and the corners a little rounded so that defrosting and cleaning may be easily accomplished. If rounded too much the storage capacity will be reduced if square cornered packages are stored.

INSULATION

Materials commonly used for insulation purposes include cork, rock wool, glass wool and others. Due to dimension limitations, both inside and outside, 4 inches of insulation is the most common thickness used. This seems adequate, provided the refrigerating unit is designed accordingly. Normally, the thicker the insulation, the smaller is the refrigerating capacity required and the electric energy consumption is decreased.

Each freezer should have a breaker strip at the openings to reduce the transfer of heat from the outside surface to the inner liner. It is also important that the door close tightly to prevent warm air from leaking past it. If the door does not close tightly, warm, moist air leaks in, which will increase the energy consumption. This may also cause the

door to freeze shut. Perhaps the best way to insure a tight seal is to provide the freezer with a latch which exerts pressure on both the door and gasket. In some cases it may be desirable to have provision for locking the freezer.

When choosing a freezer, check the thickness of the insulation between the compressor compartment and the storage space. If inadequate, excessive heat leakage may result with air temperatures above zero degrees Fahrenheit in the storage space closest to the compressor.

The freezer insulation should have a vapor barrier between the insulation and outer shell. This is necessary to maintain the efficiency of the insulation. Should warm, moist air leak into the insulation from the outside, the moisture will freeze in the air spaces of the insulation. In time, this will greatly decrease its efficiency or may cause breaking of the freezer walls. There is no adequate means of testing for vapor seal. The buyer must depend upon the manufacturer's word and reputation.

COMPRESSOR AND MOTOR

There are two types of compressors used with freezer cabinets. The open type unit is usually belt driven and is easily serviced and replaced. However, it will require oiling and more care than the hermetically sealed type.

The hermetically sealed unit is usually directly driven, the motor and compressor being sealed into one housing. This compressor requires no service, but when anything goes wrong, the whole unit must be replaced. It is therefore important that the dealer have spare units available to replace faulty ones, since the repair of hermetically sealed compressors is usually a factory or shop job.

It is very important that all freezer motors have self protection from thermal overloads. Also, the refrigeration system, which is usually filled with Freon 12, should have a drier to take all moisture out of the refrigerant. If only a very small amount of moisture enters the refrigerant it will probably cause the expansion valve or capillary tubing to freeze and put the entire system out of operation.

HARDWARE AND ACCESSORIES

The hardware should be rust-proof. Moisture may collect on the hardware as well as on the external walls, and if the finish is faulty, rusting may occur.

The freezer should be equipped with an adjustable temperature control. Under storage conditions this control should be set to provide zero degrees Fahrenheit. In fact, for any setting of the temperature control the stable storage temperature should be as close to zero as possible. For freezing, the temperature control should be capable of attaining -20 degrees Fahrenheit in the freezing compartment.

Another useful accessory is the freezer alarm. It should be set to operate when any portion of the storage space rises to a temperature higher than 10° to 15° F. The warning signal may be a light if the freezer is located in or near some work area. However if the freezer

is located in some out of the way spot, an alarm bell should be used. Upon receiving the warning that the freezer temperature is up, adequate steps can be taken to repair the freezer if necessary and save the food from spoilage.

Tests to determine the ability of freezers to maintain refrigeration temperatures after a mechanical or power failure were made by the U. S. Department of Agriculture. It was found that the time required for food to reach 30 to 40 degrees Fahrenheit varies with the freezer, and with the amount and position of the food in the freezer. In a chest-type freezer, the shortest time for the first package to reach 32 degrees Fahrenheit with full load was 44 hours; with one-third load, 33 hours. The shortest time to reach 40 degrees Fahrenheit under the same conditions was 84 and 47 hours respectively. The top layers in the freezer thawed first under full load conditions. It is suggested that dry ice be used to maintain the freezer temperature if it can be secured. In all cases of failure, the freezer should not be opened, except to put in dry ice, as it will increase the temperature more rapidly and cause the food to spoil sooner.

WARRANTY

Each freezer should have a warranty to protect the buyer against defective materials and workmanship. Such warranties usually cover a period of one to five years for the replacement of the mechanical refrigerating system and up to one year for the complete freezer if proven defective in workmanship or material. Some manufacturers offer insurance, for periods of one to five years, without cost and others for a small fee on the food stored in the freezer.

ENERGY CONSUMPTION

The energy consumption of home freezers depends upon the size, room temperature, kind and thickness of insulation and other factors. The U. S. Department of Agriculture reports that 17 to 21 cubic foot freezers, operating in a room temperature of 80° Fahrenheit, and having 1/2 horsepower compressors, used a little more than 4 kwh per day. According to a New York report, a 28 cubic foot upright freezer used 115 kwh per month. Indiana found that the average energy consumption for six farm freezers per cubic foot per month was 6-2/3 kwh.

SUMMARY

TYPES OF FREEZERS

1. Chest Type Freezer

Counterbalanced lid

Height about 36 inches

Width - such that all storage space can be reached easily.

One dimension such that it will pass through a 30 inch door.

Wire baskets and dividers desirable.

The inner wall surfaces should be smooth, rust free, and the finish should not impart a foreign flavor to the food.

2. Upright Type Freezer

Side opening doors - some have inner doors in addition.

Sliding drawers - some come so equipped.

Depth - limited to pass through a 30-inch door.

SIZE OF COMPARTMENTS AND TEMPERATURES

Storage compartment - capacity 25 to 30 pounds of frozen food per cubic foot; 5 to 6 cubic feet required per person.

Freezing compartment - should not exceed 5 to 10 percent of total capacity.

Freezing capacity - freezing of 50 pounds of meat in a 20 cubic foot freezer proved satisfactory.

Fan in freezing compartment - reduces freezing time to one-half.

Keeping quality of meat - 12 months if kept at zero; pork and poultry slightly rancid in four months at 10 degrees.

The surface temperature of the cabinet walls on freezer plates should not go below -20° to -30° F.

INSULATION

Materials commonly used are glass wool, rock wool, cork and others. The common thickness is 4-inches.

To maintain the efficiency of the insulation, it should be vapor sealed.

A breaker strip at the door prevents the transfer of heat from the outer surface to the inner liner.

A latch which exerts pressure on both the door and gasket insures a tight seal.

COMPRESSOR AND MOTOR

Both open type, usually belt driven, and hermetically sealed compressors are used. The open type requires more attention. If anything goes wrong with the hermetically sealed unit, it must be replaced.

Freezer motors should have self protection from thermal overloads.

The refrigeration system should be equipped with a drier.

HARDWARE AND ACCESSORIES

The hardware should be rust-proof.

An adjustable temperature control should be installed.

A freezer alarm set at 10° to 15° F. is a useful accessory.

Mechanical or power failure - USDA tests showed the shortest time for the first package to reach 32° F. to be 44 hours with full load; with one-third load, 33 hours. Dry ice can be used to maintain the freezer temperature while repairs are made.

WARRANTY

Mechanical refrigerating system - one to five years.

Complete freezer - up to one year.

Food insurance - one to five years without cost or a small fee.

ENERGY CONSUMPTION

Depends upon size, room temperature, kind and thickness of insulation, etc.

USDA reports 4 kwh per day for 17 to 21 cu. ft. freezers.

Indiana found that six freezers used an average of 6-2/3 kwh per cu. ft. per month.

